

LVII.—*Further Notes on Fossil Fishes from the Karoo Formation of South Africa.* By A. SMITH WOODWARD, F.L.S.

[Plate XVII.]

A LIST of all the known fossil fishes from the Karoo formation of South Africa was given in these pages four years ago*, and since that time only one additional species seems to have been recorded †. It is gratifying now to be able to extend the list by adding no less than four new forms; and the following brief descriptions are published in the hope that they may lead to the discovery of more satisfactory specimens than any of those at present available. For this new evidence the writer is indebted to David Draper, Esq., of Newcastle, Natal, and to Professor H. G. Seeley, F.R.S., the former having brought to Europe for determination the species numbered 1 and 4, the latter having discovered those numbered 2 and 3 during his visit to Cape Colony a few years ago.

1. *Dictyopyge* (?) *Draperi*, sp. n.
(Pl. XVII. fig. 1.)

Type.—The type and only known specimen of this species is shown of the natural size in the accompanying Pl. XVII. fig. 1. Apart from some fracturing, it is complete and scarcely distorted as far as the caudal pedicle; but the caudal fin, the most important feature in the fish, is unfortunately wanting. It is preserved in the National Museum, Bloemfontein, Orange Free State.

Description.—The proportions of the fish indicated in the figure are probably almost natural, the length of the head with opercular apparatus being about equal to the maximum depth of the trunk and contained perhaps five times in the total length. The head is much fractured, but impressions of the cranial bones seem to exhibit traces of a rugose ornament, and the hinder portion of the mandible is distinctly marked with longitudinal striations. The orbit must have been very large, and the maxilla is shaped as in Palæoniscidæ, with a deep posterior plate and a downward inflexion of the postero-inferior angle. There are some remains of conical teeth of

* A. Smith Woodward, "On *Atherstonia*," Ann. & Mag. Nat. Hist. [6] vol. iv. (1889), p. 242.

† *Acrolepis* (?) *digitata*, Smith Woodward, Cat. Foss. Fishes Brit. Mus. pt. ii. (1891), p. 508, pl. xv. fig. 4.

moderate size. The opercular bones are smooth and the suboperculum seems to have been at least as deep as broad and little inferior in size to the operculum. All the fins are small, and conspicuous fulcra are preserved on the pectoral and dorsal. The pectoral fin-rays, not less than sixteen in number, do not appear to have been articulated except perhaps at the distal extremity; the pelvic fins, though imperfect, are evidently relatively small and short-based and arise midway between the pectoral arch and the anal fin. The rays of the dorsal and anal fins exhibit distant articulations, and in each fin there are a few short basal rays in front of the long anterior rays on which the fulcra are arranged. The dorsal fin is at least as deep as long, comprising about twenty-five rays besides the basals, and is almost completely in advance of the anal fin, which has a much greater extent and comprises not less than forty, perhaps forty-five, rays in addition to the basals. The whole of the trunk is covered with scales, and there is a series of large post-claviculars attached to the hinder border of the pectoral arch; there are also one or two enlarged ridge-scales at the origin of the dorsal and anal fins. The scales of the flank are about as deep as broad, but become much narrowed ventrally and reduced in size on the caudal pedicle. One of the post-claviculars is marked with oblique ridges and all the principal scales exhibit numerous fine oblique pectinations at their hinder margin, a character gradually becoming obsolete on the caudal region; apart from the pectinations, all the scales are smooth. The lateral line is conspicuous.

Generic Determination.—The absence of the tail renders it impossible to determine with certainty the family position of the specimen just described; but it may be placed either in the comprehensive family of Palæoniscidæ or in the Catopteridæ. Before the discovery of the species of *Dictyopyge* in the Hawkesbury Beds of Australia* it would have been concluded that such a head as is possessed by the South-African fossil could only belong to a Palæoniscid and undoubtedly implied a strongly heterocercal tail. The Hawkesbury fishes, however, have most distinctly the same type of head, combined with a remarkably atrophied heterocercal tail, such as occurs in *Dictyopyge* and *Catopterus*. No decision as to the genus can therefore be arrived at until the caudal extremity is discovered. If the fish is a Palæoniscid

* Smith Woodward, "The Fossil Fishes of the Hawkesbury Series at Gosford," Mem. Geol. Surv. N. S. Wales, no. 4 (1890), pp. 16-22, with figs.

it cannot be distinguished from the genus *Rhadinichthys*; if it belongs to the family Catopteridæ it may be assigned to *Dictyopyge*. As a provisional determination the latter course is here preferred; for the Australian fishes already mentioned occur in association with *Cleithrolepis*, and so also does the new specimen discovered by Mr. Draper.

Specific Determination.—Whether, however, this fish belongs to *Rhadinichthys* or to *Dictyopyge*, the combined characters of the scales and fins are sufficient to distinguish it from all known forms, and it may therefore receive the specific name of *Draperi*.

Formation and Loc.—Stormberg Beds (Upper Karoo); Rouxville, Orange Free State.

2. *Atherstonia minor*, sp. n.
(Pl. XVII. figs. 2, 2 a.)

Type.—This species is founded on the middle portion of a small fish shown of the natural size in Pl. XVII. fig. 2, while the greater part of the trunk of a still smaller fish adds some further particulars concerning the dorsal fin and squamation. Both specimens were discovered by Professor H. G. Seeley, F.R.S.

Description.—The fish thus indicated was evidently elongate-fusiform in shape, with relatively large and extended pelvic and anal fins. The depth of the trunk at the origin of the anal fin is about equal to the space between the latter and the origin of the pelvic fins. The fin-rays are numerous and slender, and those of the median fins are shown to be distantly jointed; fulcra are not preserved. The dorsal fin arises very slightly in advance of the anal, but its relative proportions cannot be determined. The scales of the middle of the flank are scarcely deeper than broad, and only those of the caudal region are strengthened by an inner rib; all the abdominal flank-scales, however, are united by a prominent peg-and-socket articulation. The scales are narrowed dorsally and ventrally, and there is evidence of a continuous series of greatly enlarged dorsal ridge-scales, besides a large median scale at the origin of the anal fin. Each flank-scale is marked by from four to six oblique longitudinal ridges, mostly continuous, but not parallel and not always straight, being slightly curved; while the dorsal ridge-scales are similarly ornamented by longitudinal lines. None of the scales are serrated.

Generic Determination.—The characters of the imperfect fossils thus described suffice to place them in the Palæoniscid

genus *Atherstonia*, already obtained from the Beaufort Beds of Colesberg, Cape Colony; the enlarged series of dorsal ridge-scales combined with the arrangement of the fins and the nature of the scale-ornament being especially diagnostic.

Specific Determination.—It is, indeed, difficult to distinguish the new fossils, except in size, from the typical *Atherstonia scutata*. The species discovered by Professor Seeley, however, seems to have had a somewhat more robust trunk, with the dorsal fin slightly more remote than in the fish already known; it may therefore be recorded as *Atherstonia minor*.

Form. and Loc.—Beaufort Beds (Lower Karoo) in association with Theriodont Reptiles; Klip Fontein, on the farm of the Brothers Erasmus, S.W. of Fraserburg, Nieuwveldt Range, Cape Colony.

3. *Atherstonia Seeleyi*, sp. n. (Pl. XVII. figs. 3, 3 a.)

Type.—The only known fragment of this species is shown of the natural size in Pl. XVII. fig. 3, with impressions of four scales enlarged in fig. 3 a. It was discovered by Professor H. G. Seeley, F.R.S.

Description.—The fish must have had a comparatively deep trunk, but it is impossible to obtain any of the proportions from the single known specimen. Of the fins, only one of the pelvic pair and the anal are preserved, both comprising numerous distantly articulated rays, of which some apparently show traces of a longitudinal striation. The pelvic fin has a much extended base-line, and is considerably smaller than the anal fin. All the scales preserved, except at the ventral border, are much deeper than broad, and those immediately at the base of the anal fin, though relatively very small, are equilateral. There seems to have been one enlarged ridge-scale at the origin of the anal fin. The scales of the flank are united by a large peg-and-socket articulation, but there are no indications of an internal median rib, and all are elaborately ornamented with conspicuous oblique ridges. A natural impression of the external surface of four adjoining scales is shown of four times the natural size in fig. 3 a, and it will be observed that the irregular oblique ridges exhibit a tendency towards convergence at the postero-inferior angle.

Generic Determination.—It is evident that the ichthyolite thus described belongs either to the Palæoniscidæ or to the Platysomidæ; and on account of the great development of the pelvic fins we prefer to assign it to the first family. The few generic characters enumerated are the same as those of

Atherstonia, with one exception, namely, the considerable deepening of the flank-scales ; and, in the absence of further evidence, it may be doubted whether such a character is truly of generic value. The fish is therefore referred provisionally to *Atherstonia*.

Specific Determination.—Whatever be the generic position of the fish, the proportions and ornamentation of the scales at once distinguish it specifically from all known Palæoniscids and Platysomids ; and it may be appropriately named in honour of the discoverer.

Form. and Loc.—Beaufort Beds (Lower Karoo) ; Klip Fontein, on the farm of the Brothers Erasmus, S.W. of Fraserburg, Nieuwveldt Range, Cape Colony.

4. *Undetermined Palæoniscid Fish.* (Pl. XVII. fig. 4.)

There is evidence of another Palæoniscid fish from the Karoo formation in an imperfect specimen, of which the caudal region is shown of the natural size in Pl. XVII. fig. 4. It cannot, however, as yet be generically or specifically determined. The trunk is elongate-fusiform and completely covered with rhombic scales ; the upper caudal lobe is attenuated. The pelvic fins are relatively small and the dorsal fin is remote, almost as large as the anal and directly opposed to the latter. The dorsal and anal fins are triangular, about as deep as broad, and each is fringed with a conspicuous series of small fulcra. The caudal fin is forked, apparently almost symmetrical, and all the rays of the median fins exhibit well-spaced articulations. The scales are too imperfectly preserved to exhibit anything beyond their relative proportions ; and the course of the lateral line cannot be distinguished. None of the flank-scales appear to be deeper than broad, and no enlargement of the ridge-scales can be observed except on the upper caudal lobe and perhaps at the origin of the anal fin.

The specimen is preserved in coarse sandstone, exhibiting a stain of mineral matter almost parallel with its margin, and its interest centres specially in the fact that it was discovered in a stratum not hitherto known to yield fish-remains. It is preserved in the Museum at Pietermaritzburg.

Form. and Loc.—Sandstone referred by Mr. Draper to the Molteno Beds (part of the Lower Stormberg series of the Karoo formation), 150 feet above the main coal-seam ; Sutherland's Quarry, Biggarsberg, Natal.

EXPLANATION OF PLATE XVII.

- Fig. 1.* *Dictyopyge* (?) *Draperi*, sp. n.; fish wanting caudal fin.—Stormberg Beds, Rouxville, Orange Free State.
- Fig. 2.* *Atherstonia minor*, sp. n.; middle portion of trunk.—Beaufort Beds, Klip Fontein, S.W. of Fraserburg, Nieuwveldt Range, Cape Colony.
- Fig. 2 a.* Ditto; scales, four times nat. size.
- Fig. 3.* *Atherstonia Seeleyi*, sp. n.; portion of trunk with pelvic and anal fins.—Ibid.
- Fig. 3 a.* Ditto; natural impression of scales, four times nat. size.
- Fig. 4.* Undetermined Palæoniscid fish; caudal region.—Molteno Beds, Biggarsberg, Natal.

[Unless otherwise stated the figures are of the natural size.]

LVIII.—*On some British Upper-Jurassic Fish-remains, of the Genera Caturus, Gyrodus, and Notidanus.* By A. SMITH WOODWARD, F.L.S.

[Plate XVIII.]

THERE are still numerous British fossil fish-remains, named or briefly noticed by Agassiz, awaiting some definite description; and the first two of the following notes relate to Upper-Jurassic species unsatisfactorily treated in the 'Poissons Fossiles.' The third note refers to a very rare form of Selachian tooth from the Oxford Clay; and each of the species described is as yet known from such imperfect materials, that the brief review of the subject below may call attention to the deficiency and lead to the discovery of other specimens.

1. *Caturus angustus*, Agassiz. (Pl. XVIII. fig. 1.)

1844. *Caturus angustus*, L. Agassiz, Poiss. Foss. vol. ii. pt. ii. p. 118.

Among the numerous species of Upper-Jurassic fishes noticed by Agassiz under names with inadequate description is a form of *Caturus* from the Portland Oolite of Garsington Hill, near Oxford. It is named *Caturus angustus*, and dismissed with the brief diagnosis:—"Espèce très-allongée, remarquable par le développement excessif des fulcres du lobe supérieur de la caudale. Du portlandien de Garsington près d'Oxford." No information is afforded as to the owner of the original specimen or the museum in which it was preserved; and it is thus perhaps a matter of speculation to identify the actual fossil on which the notice is based. So